

Understanding Attitudes and Support for Leave No Trace: Informing Communication Strategies With Frontcountry State Park Visitors

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Abstract

This study examined frontcountry state park visitors' attitudes toward and support for common Leave No Trace practices. Understanding state park visitors' attitudes toward Leave No Trace practices and support of the program can inform the development of effective educational communication strategies and specific messaging, for park and protected area managers to address and potentially reduce recreation-related impacts. Data were collected through on-site surveys administered to visitors in three Wyoming state park units. Results indicate that while there are statistical differences among park visitors' attitudes, a uniform approach to Leave No Trace-based communication strategies in state parks may be effective at minimizing depreciative behavior in these parks and in other protected areas.

KEYWORDS: Leave No Trace; environmental education; frontcountry; recreation impacts; state parks

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Influencing visitor behavior in a manner that minimizes recreation-related impacts is a challenge for park and protected area managers (Ham & Krumpel, 1996; Hammitt, Cole, & Monz, 2015; Hendee & Dawson, 2002). Land managers attempt to strike a balance between protection of resources and the provision of recreational opportunities, yet resource degradation due to inappropriate visitor behavior continues to be a significant issue. Otherwise, well-intentioned visitors to parks and protected areas may impact wildlife, vegetation, water quality, and other visitors' experiences. Many of these impacts can be cumulative over time and have been shown to occur at relatively low levels of use (Hammitt et al., 2015; Leung & Marion, 2000; Marion, Leung, Eagleston, & Burroughs, 2016).

Land managers use one of two primary approaches for dealing with visitor impacts: indirect management actions such as education and communication, or direct management actions such as rules, regulations, or restrictions on use or access (Hendee & Dawson, 2002; Manning, 2003; Marion & Reid, 2007; Martin, Marsolais, & Rolloff, 2009). Direct management approaches tend to be costly and can limit visitors' sense of freedom, while indirect management approaches such as visitor education and interpretive communication techniques are viewed as "light-handed" and are favored by the public and land managers (Bullock & Lawson, 2007; Manning, 1999, 2003; Marion & Reid, 2001; Martin et al., 2009). As a result, visitor education efforts have become a primary method for minimizing recreation-related impacts to protected areas. This has led to the development of a variety of educational initiatives focused on responsible enjoyment of the outdoors (Marion & Reid, 2001, 2007). Despite this preference for educational approaches, effectively communicating to the recreating public about appropriate outdoor behavior is challenging. When attempting to educate visitors, managers are challenged by limited visitor time span, voluntary participation in educational efforts, and numerous distractions (Ham, 2013; Manning, 2003; Orams, 1997). To cope with these challenges, protected area managers have developed a variety of educational campaigns such as Woodsy Owl (reduction of litter), Smokey Bear (prevention of forest fire), and Leave No Trace (responsible recreation). Of these educational approaches, Leave No Trace (LNT) is the most frequently used communication strategy for educating visitors about minimizing recreation-related impacts (Marion, 2014).

Despite several advances in understanding knowledge, attitudes, and behaviors related to LNT with visitors to backcountry and wilderness areas, information about visitors at frontcountry areas in the context of LNT is quite limited. Frontcountry includes areas that are easy to access by vehicle and predominately visited by day users (Leave No Trace Center for Outdoor Ethics, n.d.-b; Marion, 2014). These areas include developed campsites used for overnight car camping, which often have tent pads, picnic tables, fire rings, and toilet facilities. Visitation to frontcountry areas is increasing, and in many areas, this is where managers direct the majority of visitors (Kuentzel, Laven, Manning, & Valliere, 2008). The over 6,600 state parks in the U.S. provide extensive recreational opportunities in such frontcountry settings. According to the National Association of State Park Directors (2015), annual visitation to state parks is more than 730 million, a number that is projected to significantly increase over time. The purpose of this study is to explore frontcountry state park visitor attitudes toward, and support of, common LNT practices in three Wyoming parks, and to determine if attitudes and support vary by park type. Understanding visitor attitudes related to LNT is critical in order to craft effective, strategic messages that have the potential to reduce depreciative behavior in park and protected areas (Vagias & Powell, 2010).

Leave No Trace

The overarching intent of the LNT program is to minimize recreation-related impacts by educating outdoor enthusiasts about the nature of their impact, as well as teaching them techniques for minimizing the impact (Harmon, 1997; Marion, 2014; Marion & Reid, 2007). The

program today has become a 501c(3) not for profit, known as the Leave No Trace Center for Outdoor Ethics (the Center). The Center's mission is "to teach people how to enjoy the outdoors responsibly" (Leave No Trace Center for Outdoor Ethics, n.d.-a; Marion & Reid, 2001).

The Center has been under a Memorandum of Understanding (MOU) with the largest federal land management agencies in the United States (USDA Forest Service, National Park Service, Bureau of Land Management, U.S. Fish and Wildlife Service, and the Army Corps of Engineers) since 1994, making it the predominant source for minimum impact-based communication in most parks and protected areas (Marion, 2014). Furthermore, in 2007 the Center entered into an MOU with the National Association of State Park Directors to create a stronger linkage between state parks and national LNT efforts (Leave No Trace Center for Outdoor Ethics, 2018).

The foundation of the LNT program is the Seven Principles (Figure 1), which can be seen in most parks and protected areas in the United States and many abroad. The Seven Principles are often displayed on protected area signage, maps, and websites, as well as included in interpretive information, thus incorporating various forms of environmental communication dissemination that have been proven effective (Hansen & Machin, 2013). These brief principles can be applied to any type of protected area environment (e.g., alpine, mountain, desert, rainforest) as a way of mitigating depreciative resource and social impacts, although greater specificity comes with specific environments and social conditions. Furthermore, each principle represents more explicit recommended actions associated with the original principle. For example, with regard to Principle 4, "Leave What You Find," the Center provides additional language stating that when recreating in protected areas, you should "leave rocks, plants, and other natural objects as you find them." With regard to Principle 7, "Be Considerate of Other Visitors," the Center recommends that you "respect other visitors and protect the quality of their experience (Leave No Trace Center for Outdoor Ethics, n.d.-c).

Seven Principles of Leave No Trace

1. Plan Ahead and Prepare
2. Travel and Camp on Durable Surfaces
3. Dispose of Waste Properly
4. Leave What You Find
5. Minimize Campfire Impacts
6. Respect Wildlife
7. Be Considerate of Other Visitors

Figure 1. The Leave No Trace principles. From "Leave No Trace Principles," Leave No Trace Center for Outdoor Ethics, n.d.-c (<https://lnt.org/learn/7-principles>).

Previous Research

The LNT literature base has been derived from two primary scientific disciplines: recreation ecology and human dimensions of natural resources. Recreation ecology examines the biophysical impacts of visitors to protected areas (Leung & Marion, 2000) and has largely provided the underpinning for LNT messaging (Cole, 2004; Hammitt et al., 2015; Hampton & Cole, 2003). Most LNT-related research to date has been rooted in recreation ecology studies (i.e., examining the impact on ecological resources as a result of recreation), and reviews state that over 1,000 recreation ecology articles have been published in recent decades (Monz et al., 2010). However, to mitigate recreation-related impacts, managers and educators must understand how visitors perceive their interaction with the natural world, or the human dimension of parks and protected

areas (Ewert, 1996; Miller, Freimund, Metcalf, & Nickerson, 2018; Vagias & Powell, 2010), which has been underrepresented in LNT-related research.

The preponderance of human dimensions research related to LNT has evaluated educational efficacy through various communication strategies in an effort to increase knowledge and influence minimum impact behaviors of recreationists (Marion & Reid, 2007). Most studies have focused on existing knowledge to gain an understanding regarding minimum impact behaviors. For example, studies have evaluated communication strategies for mitigating specific impacts such as littering, collection of natural objects, and off-trail hiking (see Cialdini, 1996; Park, Manning, Marion, Lawson, & Jacobi, 2008; Widner-Ward & Roggenbuck, 2003). Research has shown that strategic communication can lead to perceived sense of place and a sense of attachment to parks and protected areas (Rickard & Stedman, 2015). Furthermore, calculated communication efforts can influence pro-environmental intentions, a key antecedent to environmentally conscious behavior in parks and protected areas (Arendt & Matthes, 2014; Halpenny, 2010). Few studies, however, have specifically addressed educational communication within the context of LNT and have instead focused on generic minimum impact communication strategies (Marion, 2014; Marion & Reid, 2001). Even less research has examined visitors to frontcountry areas (see Jones & Bruyere, 2004; Jones & Lowry, 2004; Lawhon et al., 2013; Leung & Attarian, 2003; Mertz, 2002).

Social scientists have recently begun to explore key aspects of the LNT program among outdoor enthusiasts, including their salient attitudes toward the program (Lawhon et al. 2017; Taff, Newman, Vagias, & Lawhon, 2014; Vagias & Powell, 2010; Vagias, Powell, Moore, & Wright, 2012, 2014). This is an important development, since psychological constructs such as attitudes tend to be a more accurate predictor of behavior (Ajzen, 1991) rather than knowledge alone. The use of knowledge as the measured outcome has limitations given the lack of a clear linear relationship between environmental knowledge and behavior (Hungerford & Volk, 1990). Simply put, behavior change in outdoor enthusiasts does not occur just because individuals are made aware of their environmental impact. However, to date few studies have specifically focused on frontcountry state park visitors' attitudes and support related to LNT. Therefore, it is pertinent that researchers examine perceptions, such as attitudes, which drive behavior, so that appropriate educational communication strategies can be implemented (Rickard, McComas, & Newman, 2011). This research aids in filling this void by evaluating LNT in the state park context.

Theoretical Foundation

The theory of planned behavior (TPB) informs this research (Ajzen, 1991; Fishbein & Ajzen, 2010). The TPB has been applied to numerous human dimensions of natural resources studies, (Fishbein & Manfredo, 1992; Manfredo, Teel, & Bright, 2004; Miller, 2017) and more recently to LNT-focused research (Vagias et al., 2014). The TPB is a general theory of social psychology that seeks to explain the determinants of human behavior. The overarching assertion of the theory is that humans are rational creatures whose behaviors are chiefly determined by their intention to engage in said behavior (Fishbein & Ajzen, 2010; Miller, 2017). Behavioral intentions are determined by attitudes, the normative influence of others, and perceived behavioral control (Ajzen, 1991; Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975). Attitudes are commonly described as an individual's appraisal of a particular object (Eagly & Chaiken, 1993). When an appraisal of an object has taken place, and a particular attitude about that object has been formed, the attitude can influence future behavior. Consequently, LNT-related behavior is potentially determined, in part, by attitudes toward explicit LNT guidelines and recommended practices. Therefore, park managers may be able to influence visitor behaviors by targeting the salient attitudes that drive the behavior in question (Vagias et al., 2014).

Hypotheses

This study primarily aimed to determine if there are statistically significant differences between visitors to three parks with respect to their attitudes toward and general support of LNT. Additionally, it examined the effect size of relationships among the variables. The absence of statistically significant differences or finding of minimal effect sizes on key variables would suggest that a standardized educational approach may be appropriate and effective. However, significant differences among visitors to the three parks would suggest that varying educational strategies between parks may be warranted for park managers to target depreciative behaviors effectively. This study used data to explore the following hypotheses:

- H_1 —State park visitors' attitudes toward the appropriateness of specific LNT practices do not significantly differ between parks
- H_2 —State park visitors' attitudes toward the perceived effectiveness of specific LNT practices do not significantly differ between parks
- H_3 —State park visitors' attitudes toward the perceived difficulty of carrying out specific LNT practices do not significantly differ between parks
- H_4 —State park visitors' general support of LNT does not significantly vary between parks

Method

Sampling Locations

The Wyoming State Parks, Historic Sites, and Trails manages 30 state parks and historic sites. The annual visitation to these areas was 4.25 million in 2015, which represented an 8% increase from 2014, and a 28% increase based on the 5-year average visitation between 2010 and 2014 (Wyoming State Parks, Historic Sites, and Trails, n.d.). Three units were selected for inclusion in this research: Glendo State Park (Glendo), Glendo, Wyoming; Curt Gowdy State Park (Gowdy), Laramie, Wyoming; Wyoming Territorial Prison Historic Site (Prison), Laramie, Wyoming. The study locations were selected because all receive significant annual visitation based on their size, location, and amenities, and all receive resident and nonresident visitors. However, these parks are very different. Glendo State Park primarily offers motor boating, RV camping, and angling; Curt Gowdy State Park primarily offers motor and nonmotorized boating, angling, RV and tent camping, hiking, and mountain biking; and Wyoming Territorial Prison Historic Site primarily offers historic sites and displays, interpretive programs, living history exhibits, and limited hiking and cycling opportunities. Camping is not allowed at the prison. None of these parks had existing LNT communication strategies in place before or during data collection.

Sampling Procedure

A stratified sampling procedure was used, which segmented sampling equally between weekday, weekend, and A.M. and P.M., and which ensured representativeness of visitation and user type (Vaske, 2008). Data were collected via an on-site, self-administered survey over 4 weeks during the summer of 2012. Respondents were intercepted by trained research assistants at a variety of locations (campground, boat ramp, visitor center, trailhead, etc.) within each unit. The locations were chosen in consultation with park unit managers, based on visitation and use. Researchers asked potential respondents if they would be willing to participate in a "visitor opinion study," to not unduly bias respondents about LNT. If a potential respondent declined, researchers recorded the time they encountered the individual and asked a single nonresponse question, "What is the primary purpose of your visit today?" Sampling started with the surveyor using a random number generator and intercepting an initial respondent. After the initial survey

was completed, the surveyor intercepted the next group. This process continued throughout the sampling period. All surveys were completed on-site by a single individual, regardless of group size. Of respondents, 54% were surveyed in campgrounds, 30% at a visitor center, 9% at trailheads, 5% at boat ramps, and 1% along a greenway trail. A total of 346 surveys were completed, with an overall response rate of 93%. The individual unit response rates were 92% for Glendo ($N = 114$), 95% for Gowdy ($N = 125$), and 93% for the Prison ($N = 107$). Based on sample size and visitation to the three units, there is 95% confidence that these findings are accurate to ± 5 percentage points (Vaske, 2008).

Survey Instrument and Variables

The instrument contained psychological variables related to six of the seven LNT principles. The survey did not address the fifth principle of LNT, "Minimize Campfire Impacts," because fires are not allowed at many Wyoming state parks and historic sites. The measures used in this study were adapted from preexisting published research on LNT (see Lawhon et al., 2013; Taff, Newman, Bright, & Vagias, 2011; Taff et al., 2014; Vagias & Powell, 2010; Vagias et al., 2012, 2014). The survey items were slightly modified to fit the study objectives, population sampled, and state park settings.

The independent variable for all analyses was the categorical variable "park," which consisted of the park visited, that is, Glendo, Gowdy, or the Prison. The dependent variables consisted of attitudes toward appropriateness of LNT practices, perceived effectiveness, and perceived difficulty, and general support of LNT.

A composite variable was constructed from 12 measures designed to assess how visitors viewed the appropriateness of recommended LNT practices. These responses were measured on a 7-point scale ranging from 1 (*very inappropriate*) to 7 (*very appropriate*). Another composite variable regarding the perceived effectiveness of LNT practices was constructed from eight measures designed to assess how visitors perceive the effectiveness of recommended LNT practices for minimizing impact. Respondents were asked to indicate the level at which each recommendation would reduce negative impacts in the parks. The responses were measured on a 7-point scale ranging from 1 (*never*) to 7 (*every time*). A third composite variable regarding the perceived difficulty of practicing LNT was constructed from eight measures. Responses were measured on a 7-point scale ranging from 1 (*not at all difficult*) to 7 (*extremely difficult*). Last, a general support of LNT variable was constructed from 12 measures designed to assess visitors' general perceptions of LNT. These responses were measured on a 7-point scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*).

Internal consistency of scales measuring attitudes toward appropriateness of practices, effectiveness, difficulty, and support were examined through Cronbach's alpha reliability coefficients. One-way analysis of variance and post hoc LSD tests examined differences among the parks in attitudes toward appropriateness of practices, perceived effectiveness and difficulty, and support. Eta effect sizes were reported where appropriate, which provided a measure of practical significance (Ellis & Steyn, 2003; Ferguson, 2009).

Results

Descriptive Findings

The mean age of survey respondents across the three parks was 47 years. Over half of the respondents (58%) were male. A plurality of individuals sampled (47%) were from Wyoming with the remaining 53% coming from over a dozen states including Colorado, Nebraska, and Idaho, among others. Nearly one third (29%) of visitors indicated that the primary purpose of their visit was camping. Just over 21% of respondents indicated that fishing was the primary

reason for their visit, and another portion of the sample (16%) indicated that visiting historical exhibits was the primary reason for their visit. Other reasons included sightseeing (11%), mountain biking (10%), boating (4.5%), hiking (4%), and picnicking (2%). Nearly 29% of respondents indicated this was their first visit to the park or historic site in the past 12 months, while 35% indicated they had visited this park or site between three and five times in the same time frame. Another large percentage of visitors (23%) reported having visited the park or historic site between six and 10 times in the past 12 months.

Reliability Analysis

Measurement reliability and internal consistency of the four composite variables were examined with Cronbach's alpha reliability coefficients. An alpha equal to or greater than .65 indicates that variables are essentially measuring the same concept, which justifies combining them into a composite (Vaske, 2008). Reliability coefficients for the four composite variables indicated acceptable internal consistency for each composite (ranging from $\alpha = .66$ to $.88$).

Combining the 12 items pertaining to visitors' attitudes toward the appropriateness of specific LNT practices into a "practices" composite produced an overall Cronbach's alpha of .69 (Table 1). The corrected interitem correlations for this composite ranged from .17 to .50. According to Vaske (2008), the general threshold for acceptable interitem correlations is $\geq .40$, and it is recommended that variables that do not meet this criteria be dropped from the scale. However, from a conceptual standpoint, we decided to leave the variables with low correlations in the composite. While we could have slightly increased the overall alpha by deleting one of the items, we retained all items in the composite since the alpha was acceptable, and we considered all the variables conceptually sound because they directly relate to the LNT principles.

Table 1

Visitor Attitudes Regarding the Appropriateness of Leave No Trace Practices

Item ^a	<i>M</i> ^b	<i>SD</i>	Corrected item-total correlation	Alpha if item deleted
Experiencing parks and historic sites by not preparing for all types of weather or hazards before I get on a trail	2.14	1.78	.26	.68
Scheduling my trip during times of high use to reduce overall impact	3.78	1.80	.24	.69
Traveling off the trail to experience the natural environment	3.21	2.10	.42	.66
Traveling around muddy spots on the trail	4.07	2.19	.24	.69
Disposing of human waste in a lake, river, or stream if there are no public facilities	1.34	1.17	.32	.68
Carrying all litter out, leaving only food scraps	4.43	2.67	.17	.71
Keeping a single item like a rock, plant, stick, or feather as a souvenir	2.89	1.83	.50	.65
Moving rocks and/or logs to make a campsite more comfortable	3.43	1.89	.46	.65
Dropping food on the ground to provide wildlife a food source	1.59	1.14	.30	.68

Table 1 (cont.)

Item ^a	<i>M</i> ^b	<i>SD</i>	Corrected item-total correlation	Alpha if item deleted
Approaching wildlife to take a photo	2.34	1.60	.46	.65
Traveling side by side with members of my group on existing trails	3.87	2.05	.38	.66
Taking breaks along the edge of the trail	5.32	1.66	.36	.67

^aCronbach's alpha for composite scale = .69. ^bAll items measured on a 7-point scale of 1 (*very inappropriate*) to 7 (*very appropriate*).

Combining the eight items pertaining to visitors' attitudes toward perceived effectiveness of LNT practices into an "effectiveness" composite resulted in an overall Cronbach's alpha of .66 (Table 2). The corrected interitem correlations for this composite ranged from .11 to .55. Despite the low interitem correlation for one variable ("Taking breaks away from the trail"), the majority of the remaining variables met or exceeded the .40 correlation standard. Thus, from a conceptual standpoint, we decided to leave all variables in the composite.

Table 2

Visitor Attitudes Regarding the Perceived Effectiveness of Leave No Trace Practices

Items ^a	<i>M</i> ^b	<i>SD</i>	Corrected item-total correlation	Alpha if item deleted
Preparing for all types of weather or hazards before I get on a trail	6.17	1.14	.27	.65
Scheduling trip to avoid times of high use	5.45	1.36	.32	.64
Staying on designated or established trails	6.27	1.03	.44	.62
Traveling single file in the middle of a trail, even when wet or muddy	5.27	1.53	.40	.62
Carrying out all litter, even crumbs, peels or cores	6.53	.992	.38	.63
Never removing objects from the area, even a small item like a rock, plant, stick or feather	5.30	1.78	.55	.58
Never approaching, feeding or following wildlife	5.61	2.01	.54	.57
Taking breaks away from the trail and other visitors	4.26	1.93	.11	.71

^aCronbach's alpha for composite scale = .66. ^bAll items measured on a 7-point scale of 1 (*never*) to 7 (*every time*) in the context of reducing impact.

Combining the eight items pertaining to visitors' attitudes toward perceived difficulty of LNT practices into a "difficulty" composite produced an overall Cronbach's alpha of .84 (Table 3). All corrected interitem correlations for this composite with the exception of one ranged from .53 to .71, representing acceptable correlations. The variable that fell below the accepted .40 correlation limit pertained to "scheduling trips to avoid times of high use." This is an important LNT concept, and directly concerns the LNT principle *Plan Ahead and Prepare*. Thus, we decided to leave this variable in the composite.

Table 3
Visitor Attitudes Regarding the Perceived Difficulty of Leave No Trace Practices

Items ^a	<i>M</i> ^b	<i>SD</i>	Corrected item-total correlation	Alpha if item deleted
Preparing for all types of weather or hazards before I get on a trail	2.15	1.36	.54	.82
Scheduling trip to avoid times of high use	2.92	1.51	.34	.85
Staying on designated or established trails	1.69	1.17	.71	.81
Traveling single file in the middle of a trail, even when wet or muddy	2.19	1.40	.62	.81
Carrying out all litter, even crumbs, peels, or cores	1.63	1.34	.63	.81
Never removing objects from the area, even a small item like a rock, plant, stick, or feather	1.91	1.42	.62	.81
Never approaching, feeding, or following wildlife	1.66	1.26	.64	.81
Taking breaks away from the trail and other visitors	2.12	1.42	.53	.83

^aCronbach's alpha for composite scale = .84. ^bAll items measured on a 7-point scale of 1 (*not at all difficult*) to 7 (*extremely difficult*).

Combining the 12 items pertaining to visitors' general beliefs about LNT into a "support" composite produced an overall Cronbach's alpha of .88 (Table 4). All corrected interitem correlations for this composite ranged from .26 to .79. Despite the low interitem correlation for two variables ("I practice LNT because park regulations state that I do so" and "In general, the opinions of others have little effect on my practicing LNT"), these variables were included in the composite because they were conceptually relevant and dropping either would not have increased the overall alpha.

Table 4
General Support of Leave No Trace

Items ^a	<i>M</i> ^b	<i>SD</i>	Corrected item-total correlation	Alpha if item deleted
Practicing Leave No Trace effectively protects the environment for future generations	6.17	1.51	.59	.84
Practicing Leave No Trace enhances my outdoor experience	6.15	1.40	.76	.83
It is important that all visitors practice Leave No Trace	6.39	1.22	.79	.83
It is important that park regulations require all visitors to practice Leave No Trace	6.12	1.42	.72	.83
The people I recreate with believe it is important to practice Leave No Trace	6.02	1.33	.71	.84
In general, the opinions of others have little effect on my practicing Leave No Trace	5.42	2.05	.30	.87

Table 4 (cont.)

Items ^a	<i>M</i> ^b	<i>SD</i>	Corrected item-total correlation	Alpha if item deleted
I practice Leave No Trace because the people I recreate with believe it is important	5.36	1.84	.46	.85
I practice Leave No Trace because the park regulations state that I should do so	4.39	2.14	.26	.88
It is important to practice Leave No Trace techniques when in the park	6.47	1.12	.65	.84
If I learned my actions in the park damaged the environment, I would change my behavior	6.42	1.22	.52	.85
I get upset when I see other individuals in the park not following Leave No Trace practices	6.35	1.10	.60	.84
I insist that Leave No Trace practices are followed by all members of my group	6.17	1.30	.58	.84

^aCronbach alpha for composite scale = .88. ^bAll items measured on a 7-point scale of 1 (*strongly disagree*) to 7 (*strongly agree*).

Analysis of Variance

One-way ANOVAs were conducted to test the previously stated hypotheses. Regarding H_1 (State park visitors' attitudes toward the appropriateness of specific LNT practices do not significantly differ between parks), we failed to reject the null hypothesis in favor of the alternative hypothesis. The ANOVA showed no statistically significant differences between the park respondents regarding attitudes toward the appropriateness of LNT practices, $F \geq 2.98$, $p \leq .052$, $\eta \geq .14$. In addition, the effect sizes for attitudes toward the appropriateness of LNT practices was minimal ($\eta = .14$). The post hoc test (LSD) revealed statistically significant differences in attitudes toward the appropriateness of LNT practices between visitors to Glendo and visitors to Gowdy ($p < .05$).

Regarding H_2 (State park visitors' attitudes toward the perceived effectiveness of specific LNT practices do not significantly differ between parks), we rejected the null hypothesis in favor of the alternative. Here the ANOVA showed statistically significant differences between respondents from the three parks regarding their attitudes toward the effectiveness of LNT practices, $F \geq 3.40$, $p \leq .036$, $\eta \geq .15$ (Table 5). Similar to the effect sizes in H_1 , the effect sizes in H_2 were minimal ($\eta = .15$). The post hoc test (LSD) revealed differences in attitudes toward perceived effectiveness of LNT between Glendo and Gowdy ($p < .05$) and between Glendo and the Prison ($p < .05$).

Regarding H_3 (State park visitors' attitudes toward the perceived difficulty of carrying out LNT practices do not significantly differ between parks), we failed to reject the null hypothesis, as the ANOVA showed no statistically significant differences among the three parks with respect to attitudes toward the perceived difficulty of practicing LNT, $F \leq 2.73$, $p \geq .066$, $\eta \leq .13$).

Regarding H_4 (State park visitors' general support of LNT does not significantly vary between parks), we failed to reject the null. In this case, the ANOVA revealed no statistically significant differences among the parks regarding general support of LNT, $F \leq 1.06$, $p \geq .346$, $\eta \leq .08$.

With respect to attitudes regarding perceived effectiveness, Gowdy and the Prison had mean scores of 5.69, yet the mean for Glendo was 5.43. The mean scores for attitudes regarding

perceived difficulty of practicing LNT were 1.94 for Gowdy to 2.05 for the Prison to 2.23 for Glendo, indicating no statistical differences among the three parks for this composite variable (Table 5).

Table 5

Differences in Attitudes Toward Practices, Effectiveness, and Difficulty, and Support by Park

Composite variables	Park			F	p	η
	Glendo (n = 114)	Gowdy (n = 125)	Prison (n = 107)			
Attitudes (Practices)	3.33 _a	3.05 _b	3.21 _{ab}	2.98	.052.	.14
Attitudes (Effectiveness)	5.43 _a	5.69 _b	5.69 _b	3.40	.036	.15
Attitudes (Difficulty)	2.23	1.94	2.05	2.73	.066	.13
Support of Leave No Trace	5.85	6.03	5.97	1.06	.346	.08

Note. Means with different subscripts are significant at $p < .05$ based on LSD post hoc tests. Composite variables based on 7-point scales. See scales in Tables 1 to 4.

Discussion

The purpose of this study was to determine if frontcountry visitors to different kinds of state parks and historic sites differed in their attitudes and support of LNT, in an effort to inform communication strategies that mitigate social and ecological impact. Overall, the results of this study highlight important considerations for state park managers with regard to LNT-based communication efforts aimed at minimizing visitor impact. A number of findings emerged that cut across park type, which warrant further discussion. The reliability scales used for assessing attitudes toward the appropriateness of practices, perceived effectiveness, perceived difficulty, and general support of LNT provide insight into how state parks can implement effective educational communication programs pertaining to LNT.

Regarding H_1 (attitudes toward the appropriateness of LNT practices), we failed to reject the null hypothesis as state park visitors' attitudes toward the appropriateness of LNT practices did not vary statistically by park. A higher mean score on the appropriateness scale indicates a limited understanding of the LNT practices and a potential willingness to accept more recreation-related impact. The mean score for Glendo was 3.33, while the Prison ($M = 3.21$) and Gowdy ($M = 3.05$) had lower mean scores, which were statistically significant. This variability suggests the need for highlighting the specific behaviors that cause impact and the techniques that minimize those impacts. While one could argue that this type of tailored, strategic communication approach may only be warranted at Glendo (or similar parks), the limited range of mean scores (particularly across the 7-point scale, 1 (*very inappropriate*) to 7 (*very appropriate*), indicates that visitors to each of the three parks could benefit from this kind of approach. In other words, there would be no foreseeable consequence from exposing visitors to all of the parks to this kind of information through strategic communication efforts.

Regarding H_2 (attitudes regarding the effectiveness of LNT practices), we rejected the null hypothesis in favor of the alternative as there were statistical differences by park with respect to perceived effectiveness. Visitors to Glendo perceived LNT to be less effective ($M = 5.43$) than visitors to Gowdy or the Prison ($M = 5.69$ in both cases). While the differences were statistically significant between the parks, similar to the attitudes regarding appropriateness of LNT practices, there was not a tremendous amount of variability, suggesting that visitors across the samples generally feel LNT is effective at minimizing impacts. Previous LNT research in other

park settings suggests that perceived effectiveness is a significant predictor of behavioral intent (Lawhon et al., 2013; Lawhon, Taff, Newman, & Vagias, 2017). Therefore, given these results, communication approaches that focus on overall effectiveness are likely warranted in all state parks, not just Glendo.

Regarding H_3 (attitudes regarding the perceived difficulty of practicing LNT), we failed to reject the null hypothesis, as the ANOVA revealed no statistically significant differences among the three parks with respect to attitudes toward the perceived difficulty of practicing LNT. There were no statistical differences by park; thus, H_3 was supported. Across all three parks, visitor perception of the difficulty of practicing LNT was “not at all difficult” ($M \leq 2.23$ in all cases). If specific recommended practices are perceived as being too difficult, there is potentially a greater likelihood that park visitors would not follow those practices. The low mean scores among the parks suggest that visitors feel that LNT practices are generally not difficult to adhere to when recreating in the parks. Previous research with overnight visitors in wilderness settings suggests that targeting perceived ease of practicing LNT could lead to behavioral intent (Vagias et al., 2014) and subsequent behaviors that are in alignment with LNT recommendations. Similarly, these findings indicate that communicating with frontcountry state park visitors about the lack of difficulty, or ease, of practicing LNT could benefit the preservation of social and ecological resources in these frontcountry settings as well.

Hypotheses 4 was not supported by the results, as general support of LNT did not vary by park. Mean scores for support were greater than 5.85 for all three parks, indicating very positive perceptions of LNT. These data suggest that state parks and historic site visitors are generally in favor of LNT as a concept. These findings are consistent with previous research, suggesting that different visitor types have positive perceptions of LNT (Taff et al., 2014; Vagias & Powell, 2010).

Practical Implications

Despite some statistical differences by park, the effect sizes suggest that these differences have little practical significance with regard to attitudes toward the appropriateness of LNT practices, effectiveness of LNT practices, or difficulty of following LNT practices. There was consistency among visitors' general support of LNT (Table 4). These findings suggest that a single, consistent LNT-based communication effort could be implemented by Wyoming State Parks, Historic Sites, and Trails regardless of park type. While it is clear that communication efforts need to highlight the kinds of behaviors that cause impact and the techniques that can reduce those impacts, it is also clear that a park-by-park LNT communication strategy may not be needed. Although tailoring LNT information may be warranted in certain ecological or social conditions (e.g., recreation areas with fragile living soil crust; areas of high crowds where social behaviors may be more impactful to visitor experience), these data suggest that Wyoming state park managers may be able to implement an effective one-size-fits-all approach with some local adjustments, as needed. This is important for modern-day land management agencies as resources for indirect management, such as education and communication, tend to be limited. A more uniform approach to LNT communication, thereby lessening the burden on the agency in terms of program development and implementation, could lead to greater adoption and use of LNT, thus minimizing experiential and ecological degradation in Wyoming state parks and similar protected areas.

State park visitors need to be provided with information about LNT recommendations to minimize their recreational impacts. However, messages that target visitors' specific attitudes regarding LNT may positively influence behaviors. Messages that accompany the LNT principles should focus on the effectiveness of these practices in minimizing ecological and social impacts and on the ease of following LNT. Additionally, communication strategies should continue to promote the support of LNT as a concept, to further solidify support of the program in parks. This research suggests that LNT communication efforts in state park frontcountry areas that uti-

lize these approaches, regardless of park type, are likely to be more effective at influencing behaviors in a manner that mitigates ecological and social impacts (Miller, 2017; Vagias et al., 2014.)

Future Research

This study has limitations that merit further investigation in future LNT-focused studies. It examined attitudes (i.e., toward practices, effectiveness, and difficulty) regarding LNT; however, theory and previous research suggest that other factors (e.g., norms, perceived behavioral control, knowledge, emotions) can influence behavioral intent (Vagias et al., 2014), which should be examined with frontcountry visitors. Also, it would be useful for research to examine how LNT communication strategies can influence behavior, moving beyond self-reported measures. Although logistically challenging, observational methods for examining behaviors in situ, as visitors are influenced by theoretically based communication strategies, could provide the most valuable insight regarding how park managers can best communicate with visitors about LNT.

This study examined three different frontcountry parks that represent the range of state parks within Wyoming. To date, most human dimensions LNT research has taken place in Western states. Future research should examine whether perceptions are salient with visitors to other regions of the country, or even internationally. Additional focus should be placed on other frontcountry protected areas, such as city and county open space, which may have a demographic of visitors with differing perceptions of LNT.

Conclusion

This study examined frontcountry state park visitor attitudes toward and support of LNT in three Wyoming state parks. Educational initiatives could build on these findings to aid the development of more effective communication strategies that mitigate depreciative visitor behaviors in these and other frontcountry areas. Although some statistically significant differences existed among samples with regard to visitor attitudes, given the effect sizes these differences lack practical significance. Therefore, these results suggest that park managers can adopt a uniform communication strategy for promoting LNT-recommended behaviors, in these and similar frontcountry-based protected areas settings.

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